REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1-5 in the underlying PCT Application No. PCT/DE03/00562 and adds new claims 6-10. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and does not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. No new matter has been added. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/DE03/00562 includes an International Search Report, dated August 22, 2003, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

It is respectfully submitted that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,

KENYON & KENYON

Reg No 36098

Dated: 8 Feb 2005

By: _____

Richard L. Mayer
Reg. No. 22, 490

One Broadway
New York, NY 10004
(212) 425-7200
(212) 425-5288

CUSTOMER NO. 26646

929928

DEVICE FOR IMPACT SENSING HAVING AT LEAST TWO PRESSURE SENSORS

~~Background Information~~FIELD OF THE INVENTION

The present invention ~~is directed~~relates to a device for impact sensing having at least two pressure sensors~~, according to the definition of the species in the independent claim~~.

BACKGROUND INFORMATION

~~It is known from~~ German ~~patent application~~Patent Application No. DE 102 101 31.0 (not a prior publication) ~~to communicate~~describes communicating absolute pressure values as well as differential pressure values.

~~Advantages of the Invention~~ SUMMARY

~~The~~An example device according to the present invention for impact sensing having at least two pressure sensors~~, having the features of the independent claim, has~~ may have the advantage over the related art that the pressure values of the pressure sensors of the example device according to the present invention may now also be made available to other vehicle systems. To that end, the example device according to the present invention is connected to those other vehicle systems, for example, through a bus, in order to communicate the pressure values to those vehicle systems also. The other vehicle systems may use these pressure values to check the plausibility of their own sensor values and/or as a substitute for a nonexistent sensor. This enables inexpensive multiple use of the pressure signals of the pressure sensors for impact detection. The additional hardware complexity is small, since in most cases an interface or a bus system to other vehicle systems is already present. The result is that pressure sensors may be eliminated for the other vehicle systems. This may also ~~simplifies~~simplify the design of the electronic systems in a vehicle.

~~Through the measures and refinements set forth in the subclaims, advantageous improvements on the device for impact sensing in a vehicle, specified in the independent claim, are possible.~~

It is particularly advantageous ~~that~~if the at least one additional vehicle system is an injection system, a climate-control system and/or a barometer function. An altitude-measuring system based on pressure may also profit from the example device according to the present invention.

The pressure value may be communicated advantageously to the other vehicle systems as an absolute pressure value or as a differential pressure value.

~~Drawing~~

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention are illustrated in the ~~drawing~~figures and are explained in greater detail ~~in the following description~~below.

Figure 1 shows a block diagram of ~~the~~an example device according to the present invention~~, and~~.

Figure 2 shows a flow chart of the sequence of operations on the example device according to the present invention.

~~Description of the Exemplary Embodiments~~

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

Pressure sensors are known from industry and from automotive applications. Depending on the design, the pressure sensors communicate absolute or differential pressure values to an analyzer unit. In the automobile, the sensors are usually utilized for controlling the engine and for sensing side crashes and triggering an airbag.

According to the example embodiment of the present invention, ~~it is proposed that~~ the pressure values which are constantly being recorded and communicated to the control unit by the sensors present for impact sensing are also ~~be~~ made available to other vehicle systems. This may make it possible under some circumstances to eliminate pressure sensors or to check pressure sensors for plausibility which are present in other vehicle systems.

Figure 1 shows a block diagram of the example device according to the present invention. Two pressure sensors 1 and 2, which are used for impact sensing, are connected via corresponding lines 3 and 4 to a processor 5. Through a third data input, processor 5 receives signals from an acceleration sensor 10, which is used to check the plausibility of the pressure sensor signals from sensors 1 and 2. Through a data input/output, processor 5 is connected to a bus 11, to which additional vehicle systems 6 through 9 are connected. Vehicle system 6 is an injection system, vehicle system 7 is a climate-control system, vehicle system 8 is a barometer function having an on-board computer, and vehicle system 9 is an altimeter.

Pressure sensors 1 and 2 are designed as micromechanical pressure sensors, which are used here for sensing side impacts and are thus located in a side part of the vehicle. The side part is largely closed, so that when a side impact occurs, pressure sensors 1 and 2 detect an adiabatic pressure increase through the deformation of the side part. That makes it possible for pressure sensors 1 and 2 to sense a side impact very quickly. Pressure sensors 1 and 2 therefore function as indirect deformation sensors.

Alternatively or additionally, it is also possible to utilize pressure sensors in the bumper or the rear, in order to also detect an impact there through an adiabatic pressure increase. More than two sensors may be used for side impact sensing. However, the use of at least two sensors makes it possible to ensure a reciprocal check of the performance of pressure sensors 1 and 2 through the evaluation of the signals that are communicated to the processor via lines 3 and 4. Because pressure sensors 1 and 2 are located in the side parts, which are opposite each other, they are

positioned in the vehicle away from a control unit. Sensors 1 and 2 have measuring amplifiers, an analog-digital converter and a transmitting element, in order to communicate the measured pressure data to processor 5. Here, unidirectional communication is provided from sensors 1 and 2 to processor 5 in a control unit. Lines 3 and 4 are also used to supply power to pressure sensors 1 and 2, the pressure sensors communicating their data to processor 5 over this direct current through amplitude modulation. Processor 5 has one receiving module each for lines 3 and 4, in order to receive the ~~received~~transmitted data. Alternatively, it is possible for the connection between pressure sensors 1 and 2 and processor or control unit 3 to be bidirectional, so that control unit 5 is also able to communicate queries to pressure sensors 1 and 2. It is further possible for pressure sensors 1 and 2 to communicate not only their measurement data to control unit 5 or the processor, but also data that have already been analyzed, for example differential pressure data or normalized data. In addition, it is possible for the connection between pressure sensors 1 and 2 and control unit 5 to be implemented via a bus, i.e., a sensor bus. This would enable control unit 5 to use only a single bus controller, and also only a single line to which sensors 1 and 2 are connected. Acceleration sensor 10 is provided here as a plausibility sensor for an impact. This means that only if acceleration sensor 10 also indicates an impact does processor 5 decide that an impact has occurred, and activates restraining means such as airbags and belt tensioners, which are not shown here. ~~But~~However, if no impact has occurred, ~~then~~ control unit 5 communicates the pressure data of the two sensors 1 and 2 to the other control units 6 through 9. These use the pressure data to check the plausibility of their own sensors or to carry out their function with this pressure data. In particular, comfort functions such climate-control system 7, barometer function 8 and altimeter 9 may dispense with pressure sensors of their own and use the values from pressure sensors 1 and 2.

From the point of view of functions alone, it is possible to dispense with the additional sensor 10 used here for plausibility checking, if it is possible to tolerate impairment of the functions

of the other vehicle systems 6-9, designed mostly for comfort, in the event of a crash, or if this impairment is slight.

It is also possible for control unit 5 to be connected to vehicle systems 6, 7, 8 and 9 via two wire connections each. A wireless or optical connection is also feasible here.

Figure 2 shows a flow chart to explain the sequence of operations on processor 5. In process step 100, processor 5 receives the pressure data from sensors 1 and 2. In process step 101, processor 5 uses the signal from acceleration sensor 10 to check whether an impact has occurred. If both the pressure data and the acceleration data indicate a side impact, then the system jumps to process step 102, and restraining means corresponding to the severity of the impact are triggered. But if no impact was detected in process step 101, which is the normal case, then the system jumps to process step 103, and the pressure data from sensors 1 and 2 is communicated to vehicle components 6 through 9. In process step 104, vehicle systems 6 through 9 then carry out their functions with the pressure data. ~~That makes~~Thus, it is advantageously possible for vehicle systems 6 through 9 to perform plausibility checks of their own measured values, or to use these pressure values directly for their own functions.

~~Abstract~~ABSTRACT

A device for impact sensing having at least two pressure sensors is described, where pressure values are communicated from the pressure sensors to a processor, and the processor performs impact sensing on the basis of the pressure value. The processor communicates the pressure values to additional vehicle systems, which use them to fulfill their own functions, or at least to carry out a plausibility check of their own pressure values.

~~(Figure 1)~~